20-Year Study Confirms Benefits of MIMA Bypass

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BY BRUCE K. DIXON
Chicago Bureau

CHICAGO — The long-term clinical benefits associated with multiple internal mammary artery bypass grafting in patients with multivessel coronary disease, compared with single internal mammary artery grafting, were confirmed in a 20-year follow-up study presented at the annual meeting of the Society of Thoracic Surgeons.

"Long-term rates of all adverse events are reduced with multiple internal mammary artery bypass, compared with single internal mammary artery bypass, as long as the grafts are placed to the two largest coronary systems," said Dr. J. Scott Rankin, who said the procedure should be considered the "therapeutic standard."

Investigators used the Duke University Cardiovascular Databank to assess 20-year outcomes and benefits of multiple internal mammary artery (MIMA) versus single internal mammary artery (SIMA) grafting and to evaluate possible differences in results between two multiple IMA configurations: left anterior descending (LAD) plus left circumflex grafts versus LAD plus right coronary grafts.

The series represents consecutive coronary bypass procedures by two surgeons working in the same practice at Duke University Medical Center, Durham, N.C., over a 3-year period beginning July 1, 1984.

One surgeon emphasized MIMA grafting for multivessel disease, and performed 654 procedures over the 3-year period. The other emphasized SIMA grafting, performing 413 procedures. "Both used primarily saphenous veins for adjunctive grafts," said Dr. Rankin, who is now with Vanderbilt University in Nashville, Tenn.

In the final analysis, there were 490 patients in the SIMA cohort and 377 in the MIMA group. Two-thirds of the latter group underwent the LAD/left circumflex combination.

"In general, the philosophy was to use the IMAs for the two largest vessels. The LAD/circumflex patients had primarily pedicled right IMA grafts to the LAD and left IMAs to the circumflex," he said.

End points for the data analysis were all-cause death, nonfatal MI, percutaneous coronary intervention, and redo coronary bypass; all four were combined as a composite end point. There were no statistically significant differences between the mostly male groups with respect to median ejection fractions, sternal infections, hospital mortality, or the 4-year requirement for redo bypass. There were small, statistically significant differences in rates of prior smoking, diabetes, and hypertension.

At 20-year follow-up, the MIMA group had a statistically significant mean reduction in nonfatal myocardial infarction of 37%, and what Dr. Rankin called a "striking" 63% reduced incidence of redo coronary bypass—from 12.6% in the SIMA group to 4.6% in the MIMA group, which was highly significant. There were statistical trends toward fewer percutaneous coronary interventions (PCIs) and all-cause mortality in the MIMA group.

In the adjusted Cox model composite end point for SIMA versus MIMA, advanced age and a higher number of comorbidities were the most important determinants of long-term positive outcome, "but multiple IMA versus single IMA also was significant, with a 17% risk reduction over the 20 years," said Dr. Rankin. "In further analyses, the average life expectancy was extended by almost 1 year in the multiple IMA patients, with a *P* value of .001." There was no significant difference between the LAD configurations.

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DR. RANKIN

"Multiple IMA grafting can be performed in over 70% of patients with multivessel coronary artery disease. Operative mortality and sternal infections in our series were not increased, and the configuration is not critical as long as the two largest vessels are grafted," he said.

In addition, multiple IMA grafting is applicable to the entire spectrum of coronary patients—including the elderly [and] diabetics—and in emergencies; results were just as good in these high-risk groups. The long-term incidence of all adverse cardiac outcomes—including nonfatal MI, PCI, redo coronary bypass, and all-cause death—are reduced, and overall composite outcome is significantly improved, statistically and clinically, over a full 20 years of follow-up," Dr. Rankin said.

These findings should affect clinical practice, Dr. Rankin said in an interview. "From our viewpoint, with the exception of the extremely elderly, we probably ought to be doing MIMA grafts in most ages and in diabetics," he said.

Furthermore, "even though women tend to have smaller vessels, as long as you really check out the [mammary arteries] so that you don't end up with one that's too small or doesn't have good enough flow, it's fine to use double [IMA grafts] in females," he added.

The road to these conclusions has been a long one, beginning with the proposition and observation 2 decades ago that MIMA grafting had superior patency.

"When we originally presented our series from 1984 and showed no increase in infection rate, nobody believed it," said Dr. Rankin, explaining that the Duke data did not turn positive until the second decade of follow-up.

"But there are all kinds of papers out now showing the advantages of MIMA grafting in patients" with severe coronary artery disease, he said. ■

Robotic Off-Pump CABG Suggests Clinical Advantages

BY DIANA MAHONEY
New England Bureau

ORLANDO, FLA. — Early clinical experience with off-pump coronary artery bypass grafting using a robotic microsurgical system suggests the procedure is a safe and effective means of myocardial revascularization, reported Dr. William F. Turner at the annual meeting of the Southern Thoracic Surgical Association.

Promising findings from an evaluation of all the patients who underwent the procedure between February 2004 and May 2005 at Trinity Mother Frances Health System in Tyler, Tex., justify the continued clinical use of the technology, said Dr. Turner of the hospital's Center of Advanced Surgery and Technology.

During the period of evaluation, surgeons used the da Vinci surgical robotic system from Intuitive Surgical (Sunnyvale, Calif.) to perform the robotic-assisted coronary artery bypass grafting (CABG) procedure in 70 patients. The system consists of a viewing and control console, and a surgical arm unit that positions and maneuvers pencil-sized surgical instruments and an endoscopic camera that are inserted through keyhole incisions between the patient's ribs.

The shorter operative time and the low complication rate could pave the way for an endoscopic, closed chest procedure for bypass surgery.

In all of the cases, the surgeons performed the surgery through a small, muscle-sparing thoracotomy on a beating heart and without the use of cardiopulmonary bypass.

The surgical technique included endoscopic saphenous vein and radial artery harvesting, endoscopic internal mammary artery (IMA) harvesting with robot assistance, and endoscopic removal of the pericardial fat pad, localization of vessels, and determination of anatomic suitability for a minimal-access, beating-heart approach, according to Dr. Turner.

The camera ports provided endostabilizer and thoracic bulldog clamp access, and the working port was the conduit for manual, off-pump anastomoses, he said.

Patients were considered ideal candidates for the robotic procedure if they had a coronary artery diameter of approximately 1.75 mm, their left ventricular ejection fraction was greater than 30%, they were not obese, they had wide intercostal space, and they had normal pulmonary function. Contraindications included having a very large heart (cor bovinum), hemodynamic instability, decompensated heart failure, inaccessible coronary artery, and morbid obesity.

With respect to preoperative risk factors in the 70 patients, 7 had cerebrovascular disease, 9 had renal insufficiency, 18 had peripheral vascular disease, 12 were older than 75 years (the mean age was 66), 21 had chronic obstructive pulmonary disease, and 15 had diabetes.

There were no operative deaths and "very few" postoperative complications, which included bleeding in two patients that necessitated reoperation, atrial fibrillation in six patients, and chest wound infection in two patients, said Dr. Turner.

"No patient experienced neurologic complications, renal failure, or the need for more than 1 day on the ventilator," said Dr. Turner.

The average time on the ventilator was 4 hours, and the average postoperative hospitalization was 5 days, he noted.

In addition, the average operative time per case over the entire patient series was 4 hours 43 minutes, although there was a steep, initial learning curve.

"For the first 10 cases, the average operative time per case was 6 hours 6 minutes, which decreased to 3 hours 50 minutes for the last 10 cases," Dr. Turner commented.

The internal mammary artery was used in all but one of the patients. The mean number of grafts per patient was two.

Of the 70 patients, 3 required conversion to sternotomy. "The conversion was elective in two of the patients—one because of an intramyocardial coronary artery and one because we were unable to harvest the IMA due to the patient's size," said Dr. Turner.

"In the third patient, the conversion was emergent—the result of a refractory hemorrhage at the distal coronary artery. This patient was converted and underwent on-pump bypass," he said.

To date, the postoperative survival rate remains 100%, and the cardiac event–free survival is 97%.

"Two patients were readmitted within 30 days [with graft occlusions] and required reintervention," said Dr. Turner. One of the two patients underwent an elective repeat bypass and was discharged after 7 days; the other received medical therapy at home, he said.

Given the decreased operative time, compared with conventional CABG procedures, and the low complication rate, robotic-assisted coronary artery bypass "may pave the way to a completely endoscopic, closed chest procedure for CABG," Dr. Turner concluded. ■